Cultural Evolution of Language

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Introduction

Language is a culturally transmitted system – children learn the language of their speech community on the basis of the linguistic behavior of that community. This cultural transmission can lead to the cultural evolution of the linguistic system, whereby language changes over time as a consequence of pressures acting on it during its cultural transmission.

Cultural evolution potentially offers an explanation for the **origins** of a linguistic system with the design features and functionality of human language, as well as an explanation for the subsequent **change** of such systems – the processes that explain the ways in which languages change on a historical timescale can also explain how languages themselves emerged.

Furthermore, the fact that languages themselves can evolve has implications for linguistic theories more generally. One goal for linguistic theory is to achieve **explanatory adequacy** (Chomsky, 1965) – an explanation of how language is acquired on the basis of linguistic data. This goal for linguistic theory explicitly links features of language with components of an innate capacity for language. However, the evolutionary dynamics arising from cultural transmission mean that we cannot infer the characteristics of the language faculty directly from a single episode of language acquisition, but must consider how any innate language faculty will interact with cultural transmission to shape languages over cultural time.

I begin by explaining exactly what is meant when we say that language is culturally transmitted and that this cultural transmission leads to cultural evolution and then I discuss what kinds of linguistic phenomena can be explained in these terms. I then go on to consider three theories of the cultural evolution of language, each of which proposes rather different mechanisms for cultural evolution. Note that this is not an exhaustive list of all possible mechanisms – rather, these three theories offer a contrasting range of accounts for the evolution of linguistic structure. Finally, I consider the ways in which cultural evolution has significance for the wider linguistic community. Although such evolutionary processes have obvious implications for our understanding of language origins and language change, their impact potentially runs deeper, to goals that lie at the heart of classic synchronic linguistics.

Cultural Transmission and Cultural Evolution

Children learn language from examples of language use, often called the Primary Linguistic Data (PLD). The PLD must be the linguistic behavior of other language users, as children acquire the language of their linguistic community. This linguistic behavior is a consequence of the internalized linguistic knowledge of these other individuals, and the PLD therefore reflects the linguistic knowledge of the individuals in a child's speech community. These individuals have grammars that define their knowledge of language and that knowledge of language guides their linguistic behavior. The child is therefore attempting to acquire a system of linguistic knowledge, a grammar, based on data that are the consequence of the linguistic knowledge, or grammars, of other individuals. Andersen summarizes this relationship between linguistic data and mental grammar as follows: "the verbal output of any speaker is determined by the grammar he has internalized . . . any speaker's internalized grammar is determined by the verbal output from which it has been inferred" (1973: 767).

Language therefore matches the sorts of general definition of culturally transmitted systems given by anthropologists or evolutionary theorists concerned with culture (e.g., Boyd and Richerson, 1985). Language, like other cultural systems, is transmitted from generation to generation via a process of learning from the behavior of others.

What are the basic steps in this transmission of language? Obviously, internalized knowledge of language (a mental grammar) is not directly physically transferred from individual to individual. Rather, language is transmitted via a more indirect route – following Andersen (1973), Hurford (1990), and Kirby (2002), Hurford explains that "a language persists historically through successive instantiations in two quite different media: (1) mental grammars of individuals, and (2) public behavior in the form of utterances" (Hurford, 2002: 302). Hurford dubs this the '**expression/induction**' cycle. Language is transmitted via expression (application of internal knowledge to produce observable behavior) and induction (acquisition/learning of a mental grammar based on some observed set of behavior).

The cultural transmission of language, based on its repeated transformation from grammar to data to grammar and so on, leads to the possibility of **cultural evolution**. Cultural evolution, in the broadest possible terms, is change in a culturally transmitted system

over time. The cultural evolution of language, then, is change in a linguistic system over time as a consequence of its cultural transmission.

What determines the way in which a culturally transmitted system, such as language, will evolve? I briefly outline below some mechanisms that drive cultural evolution. However, before doing so, it is worth considering how far such an account can take us.

One obvious goal would be to explain language change on a historical timescale – language change is manifestly a consequence of the cultural transmission of language. One theory to be discussed below (Croft, 2000) takes this as a primary goal. But how far back in time must we go before cultural transmission and evolution stop being relevant? 100 years? 1000 years? 100 000 years? As long as language has been culturally transmitted, cultural processes and cultural evolution will have been at work. Consequently, theories of the cultural evolution of language are increasingly regarded as useful tools for explaining the **origins** of aspects of linguistic structure.

The appeal of taking the process of cultural evolution to its logical explanatory limits is that it potentially offers a single, unified mechanism or set of mechanisms that can explain the origins of linguistic systems and also their subsequent change. In other words, cultural transmission potentially offers a uniform mechanism that explains both the genesis of language (a qualitative shift from a nonlinguistic system to a linguistic system) and language change (subsequent quantitative shift), at whatever temporal granularity is required. Of course, this is not to deny that biological evolution plays a role in explaining the origins of language – even if we subscribe to the strongest cultural account, we must still explain the emergence of the capacity for a culturally transmitted system of communication. Indeed, there may have been significant interactions between biological and cultural evolution during this process (see, e.g., Deacon, 1997).

Mechanisms for Cultural Evolution

What causes a linguistic system to change over time? There are several possible mechanisms for the cultural evolution of language. I outline three prominent theories that tackle this question in rather different ways and offer a range of possible answers. Briefly, the three mechanisms proposed to drive the cultural evolution of language are as follows: (1) cultural transmission itself; (2) language use; and (3) ultimate function for reproduction.

Cultural Evolution as a Consequence of Cultural Transmission

The very fact of cultural transmission can drive the cultural evolution of language. This theory as outlined here is based on ideas presented and developed by Simon Kirby, Jim Hurford, Morten Christiansen, and Terry Deacon (see, e.g., Christiansen and Devlin, 1997; Christiansen and Ellefson, 2002; Deacon, 1997; Hurford, 2002; Kirby, 2001, 2002). For convenience, I refer to these theories as **transmission theories**.

In order for a language to survive over repeated episodes of cultural transmission, it must be possible for language learners to learn that language from the PLD, and so languages must be **learnable**. The key insight of transmission theories is that this learnability constraint introduces an evolutionary pressure that results in languages themselves changing over time so as to become more learnable. Transmission theories therefore emphasize the fact that language itself adapts to its medium of transmission.

I summarize two ways in which the learnability of linguistic systems can vary: due to their generalizability from a finite set of data (**bottlenecked transmission**) and due to learnability considerations arising from the biases of language learners (**biased transmission**).

Language Evolution as a Consequence of the Data Bottleneck If a linguistic system is to persist over cultural time, it must pass through the cycle from data to grammar to data multiple times. One consequence of this passage through the medium of linguistic data is that language must be learnable from a finite set of data produced under real-world conditions.

Languages are capable of expressing an infinite range of concepts, and any member of this infinite array of expressions is interpretable in turn. Acquiring a language therefore entails the acquisition of a system for producing and understanding such an infinite set of meaningful utterances. However, the system for generating this infinite set of utterances must be acquired from a finite set of data – it is necessarily true that language learners do not see all the sentences of a language during the language learning process, because this would take an infinite amount of time. This data **bottleneck** is one aspect of the **poverty of the stimulus problem**, which is typically advanced as an argument suggesting that linguistic structure must be largely prespecified in language learners.

Simon Kirby and colleagues (see, e.g., Kirby *et al.*, 2004 for references) have argued that this data bottleneck introduces a pressure for recursively compositional linguistic structure. In other words, two significant **design features** of language (recursion

and compositionality) can be explained as a consequence of the cultural transmission of language and its subsequent cultural evolution. Bottlenecked transmission theories therefore provide a causal link between a feature of language's cultural transmission (the data bottleneck) and universal properties of linguistic systems.

Kirby argues that the data bottleneck results in pressure for certain types of linguistic structure: "This learning bottleneck leads inevitably to the emergence of a language in which structure is preserved in the mapping between semantics and strings" (Kirby, 2002: 199). Structure-preserving mappings, ubiquitous in language, are manifested in compositional syntax and regular morphology. These systems are structure-preserving in that similar signals (either syntactically or morphologically structured) convey similar (once again, structured) meanings – structure in semantic space is reflected in the structure of signals, as a consequence of the regular and compositional process of forming complex signals.

The distinctive feature of regular and compositional morphosyntactic systems is that they are **generalizable**: Individual structured meaning–signal associations in a compositional system can be generalized from other meaning–signal associations generated by that system, by virtue of identifying the relevant generalizations. Consequently, a regular and compositional system can be stable over multiple generations of cultural transmission even if language learners do not observe the full set of possible meaning–signal associations in the data they learn from. This is, of course, the situation that language learners face – they are attempting to acquire a system that is capable of producing an infinite set of meaning–signal associations on the basis of a finite set of examples.

In contrast, noncompositional or irregular systems are not generalizable. By definition, the signal associated with a particular meaning in such a system is arbitrary in terms of structure preservation, and there is no compositional or regular relationship between elements of meaning and components of signal. Language learners must observe these idiosyncratic, unstructured associations in order for these associations to survive. Given the data bottleneck, this cannot be the case for all meaning–signal associations produced by a noncompositional system. Consequently, noncompositional systems are unstable over cultural time.

The data bottleneck implicit in cultural transmission therefore introduces a pressure for generalizability. Linguistic systems (or subparts of linguistic systems) that are highly generalizable, such as recursively compositional syntax or regular morphology, will be more likely to survive cultural transmission intact than systems that are not generalizable. Languages themselves will evolve over cultural time to be more and more structured and more and more generalizable, as a consequence of the pressure introduced by the data bottleneck. Regular morphology and recursive compositionality therefore represent adaptations by language in response to its cultural transmission.

This theory provides a cultural explanation for these basic design features of language. However, instances of irregularity and noncompositionality are not uncommon in language. Morphological paradigms exhibit some irregularity. Idioms are an obvious example of noncompositionality. More generally, it has been argued that certain social functions of language are encoded and expressed in a noncompositional way, as holistic associations between complex meanings and unanalyzed signals (Wray, 2002). Bottlenecked transmission theories also offer an explanation for such **deviations** from the general properties of regularity and compositionality.

It was assumed above that all meanings that language users wish to express are equally frequent. This is not the case – some concepts presumably need to be expressed more frequently than others. The signals associated with frequently expressed concepts will reliably occur in the data that language learners are exposed to, even in the presence of a data bottleneck, due to their frequency. Consequently, these associations are under little pressure to be part of a regular or compositional system. In contrast, infrequently expressed meanings are unlikely to make it into the PLD and are therefore under increased pressure to be expressed compositionally – the only way such meaning–signal associations can survive repeated episodes of cultural transmission is if they are capable of being generalized.

This frequency–irregularity prediction inherent in bottlenecked transmission theories matches the linguistic data. To take a specific example, the 10 most frequently used verbs in English have irregular past-tense forms. In morphological systems more generally, frequent forms tend to be irregular. Larger holistic units (e.g., idioms) also seem to occur frequently (Wray, 2002). This relationship between frequency and irregularity naturally falls out of the bottlenecked transmission account.

Language Evolution as a Consequence of Learning Bias Bottlenecked transmission theories link learnability to properties of the data available to language learners. Biased transmission theories focus on another aspect of the learnability problem: fit to the **biases** of language learners. Language learners must have some strategy for learning a language. If all aspects of linguistic structure are not equal under this

learning strategy – if some particular grammatical construction, or morphological paradigm, or configuration of lexical items, or phonological system, is more difficult to acquire than an alternative – then we should expect to see such constructions disappear from the linguistic system over time. As Deacon puts it, "[l]anguage operations that can be learned quickly and easily by children will tend to get passed on to the next generation more effectively and intact than those that are difficult to learn. So, languages should change through history in ways that conform to children's expectations" (Deacon, 1997: 110).

Morten Christiansen and colleagues (see, e.g., Christiansen and Ellefson, 2002 for references) explain certain typological distributions in terms of cultural evolution driven by the biases of language learners. To give one example, languages with a consistent ordering of heads across phrasal categories (e.g., either consistently head-initial or consistently head-final) are more common than languages that are inconsistent with respect to head order. Christiansen and Devlin (1997) explain this crosslinguistic tendency as a cultural consequence of the biases of a general-purpose sequential learning device (modeled using an artificial neural network). They found that such learning devices make more errors when attempting to learn languages with inconsistent head ordering and, furthermore, the patterns of errors made by their general-purpose sequence learning device mirrored the distribution of languages in the world. Crucially, cultural evolution driven by learner bias explains this link – languages that are hard to learn (e.g., because of inconsistent head ordering) are rare, because they do not conform to the biases of language learners and are therefore less likely to persist through repeated episodes of cultural transmission than easy-to-learn languages.

Other work on biased transmission has focused on how learning biases with respect to transparency of the meaning–signal mapping might impact language over cultural time. The developmental linguistics literature suggests that child language learners have difficulty with synonymy and homonymy – children expect that a single object will not have several possible names (Markman, 1989) and that a single word will not have several possible meanings (Mazzocco, 1997). These amount to child biases in favor of transparency in the lexical system, where each distinct meaning maps to a single unique surface form. At the morphosyntactic level, Slobin has claimed that child language learners "strive to maintain a one-to-one mapping between underlying semantic structures and surface forms" (Slobin, 1977: 186). Slobin explicitly linked the degree of transparency in

morphosyntactic systems with the ease or difficulty with which children will acquire such systems.

Kenny Smith (see, e.g., Smith, 2004) has shown that the cultural consequence of these biases will be the evolution of linguistic systems that exhibit maximal transparency – systems where the lexicon exhibits a perfect one-to-one correspondence between meanings and words, and the morphosyntactic component exhibits a perfectly compositional, regular system for expressing complex meanings, with a single unambiguous token in the surface form for each element of meaning. This process of cultural evolution can potentially explain certain diachronic phenomena, such as various kinds of leveling and simplification of morphological paradigms. These same mechanisms can also explain the **emergence** of such transparent linguistic systems from unorganized, nonfunctional systems of meaning–signal mappings. Transparent linguistic systems are obviously optimal for communication, in that they allow every possible meaning to be expressed unambiguously. However, it is important to emphasize that such systems can evolve culturally without any specific pressure for communication. Transparent systems are simply the most learnable kind, assuming that language learners have the types of biases suggested by the developmental literature outlined above.

To summarize, the basic evolutionary mechanism provided by transmission theories is adaptation of **language itself** to its medium of transmission. This leads to adaptations that are functional from the perspective of language. This is not to say that these adaptations cannot also be of use to language users, but this is a side effect of the cultural evolution of language, rather than a driving force for linguistic evolution.

Cultural Evolution as a Consequence of Language Use

The second theory of cultural evolution that I review here is that presented in Croft (2000), which represents an interesting synthesis of both functional and sociohistorical accounts of language change. Croft's main aim is to provide a unified set of mechanisms for explaining a variety of processes of language change, and the level of linguistic detail supporting his argument is impressive. Croft proposes two primary mechanisms for cultural evolution. First, language users will introduce innovations into the linguistic system during the process of communication. Second, social factors determine the differential cultural transmission of the competing linguistic variants that these innovations introduce.

Croft proposes several mechanisms for functional innovation – the introduction of new linguistic forms or structures into a language. The two main mechanisms are **form–function reanalysis**, where 'function' is roughly synonymous with 'meaning,' and **intraference**.

According to Croft's theory, form–function reanalysis occurs during language use. Language use involves attempting to communicate a particular meaning between a speaker and a hearer using a set of linguistic conventions that relate form and meaning. However, the meaning behind an utterance is necessarily fuzzy, as is the system linking meaning and form – interlocutors have no way of perfectly identifying the communicative intentions of their partners, or of gaining direct access to the meaning–form mappings employed. Instead, both meaning and the system of meaning–form mappings must be inferred during use. This error-prone process of inference allows innovations to emerge in the linguistic system – an utterance that embodies a particular structured mapping between meaning and form for one interlocutor may be interpreted by another as encoding a somewhat different meaning and/or a different form–meaning mapping. Croft listed several types of form–function reanalysis that can occur due to this process of inference of meaning during language use. I focus here on **hypoanalysis** and **hyperanalysis**.

Hypoanalysis occurs when a particular element of meaning that is conventionally given by context – either the context in which the form is used or the linguistic context provided by other parts of an utterance – is reinterpreted by the speaker as being associated with a particular linguistic form. For example, the speaker may use form F in a context that provides meaning M. The hearer instead interprets M as being conveyed by form F and, for the hearer, form F acquires additional semantic content.

This process of hypoanalysis can be illustrated with respect to the umlaut change in Germanic languages. In Pre-Old English, plurality could be expressed using an -[i] suffix (e.g., singular [go:s] corresponding to Modern English 'goose', plural [go:si]). Anticipatory assimilation subsequently resulted in fronting of the stem vowel in the plural as a result of the -[i] suffix (e.g., singular [go:s], plural [gø:si]). In early Old English, the -[i] suffix was lost by a further phonological change, leaving, e.g., singular [go:s], plural [gø:s]. Under these circumstances, the alteration between back [o:] and fronted [ø:] acquires semantic content via hypoanalysis – the fronted version of the vowel now conveys plurality, as is the case in Modern English 'geese.'

The opposite of hypoanalysis is hyperanalysis. Hyperanalysis occurs when a particular element of meaning that is conventionally associated with a particular form is reinterpreted by a hearer as being provided by context (physical or linguistic). In other words, the speaker uses some form F to express a particular meaning M, but the hearer reinterprets the form–meaning mapping in such a way that M is provided somewhere else – say, in another part of the utterance. Consequently, the form F becomes semantically bleached – for the hearer, form F does not convey the meaning M.

In addition to outlining several other subtypes of form–function analysis, Croft suggests that processes such as grammaticalization (which is often described as depending on context-induced reinterpretation) can be subsumed under these general processes of form–function reanalysis.

What consequences will hypoanalysis and hyperanalysis have for a language? Croft suggests that the repeated application of these two types of reanalysis will result in the emergence of syntagmatic isomorphism – a one-to-one correspondence between elements of meaning and elements of form within each particular utterance. Forms that are associated with little semantic content will become increasingly bleached (via hyperanalysis) and will be eliminated or will acquire a specific semantic function (via hypoanalysis), resulting in semantic 'load' being spread out among the elements of an utterance. Biased transmission and form–function reanalysis therefore offer alternative explanations for linguistic transparency.

In principle, were hyperanalysis and hypoanalysis the only forces at play, we could imagine a linguistic system with a transparent but idiosyncratic meaning–form mapping for every distinct meaning–form pair. Croft introduces a further mechanism, **intraference**, which operates paradigmatically, across different individual structured form–meaning mappings. Intraference is driven by overlap in meaning or function – different linguistic forms may convey the same meaning, and language users may identify this semantic overlap. This allows overlapping forms to be used in innovative ways, as alternative ways of conveying the common meaning. For example, German underwent a similar umlaut change to English. Though the fronted-vowel means of expressing plurality in English never achieved high productivity, in Early New High German this means of expressing plurality was extended throughout large parts of the nominal system, via intraference (Croft, 2000: 128).

Intraference is essentially a mechanism for generalization – identification of the common meaning of two or more linguistic forms and subsequent use of either form to convey that meaning. Croft suggested that intraference is a mechanism for what is often called **analogical extension**, resulting in, for

example, regularization of morphological paradigms. Croft, in common with bottlenecked transmission theories, includes a caveat regarding frequency in his explanation of this regularization process. High-frequency meaning–form associations are less prone to intraference from other form–meaning mappings due to being "independently represented units in the mind. Frequent forms thus develop and maintain irregularities" (Croft, 2000: 149).

The mechanisms outlined above are Croft's mechanisms for **innovation** – introduction of new linguistic devices for fulfilling a particular communicative function. Croft also provides a mechanism for competition between alternative form–function mappings, which is essentially social. There is an established tradition in the sociolinguistic literature that accounts for the linguistic behavior of individuals in terms of prestige and covert prestige. In these terms, the choice of a particular linguistic form in preference to alternative forms constitutes an act of identity on the part of the speaker. In Croft's model, such acts of identification determine the cultural spread of particular (functionally motivated) systems of form–meaning mapping.

Can Croft's theory achieve the maximal possible explanatory reach – can it, in principle, explain both language change (its intended explicandum) and language origins? Croft's mechanism for the cultural transmission of linguistic variants is motivated by inherently arbitrary social considerations. However, Croft envisions a constant input of new, functional variants into the arbitrary, socially motivated process of propagation. This potentially provides a mechanism for the emergence and subsequent evolution of communicatively functional, grammaticalized linguistic systems.

Cultural Evolution as a Consequence of Reproductive Utility

A third mechanism for the cultural evolution of language is provided by Martin Nowak and colleagues (see Nowak and Komarova, 2001, for review). This is an instance of a more general theory of cultural evolution, sometimes called the "natural selection of cultural variations" (Boyd and Richerson, 1985), and is included here primarily as an example of a theory of cultural change that is heavily influenced by approaches adopted from evolutionary biology.

Nowak and colleagues, like Croft, see language as a means for communication. Languages, or elements of the linguistic system, are useful inasmuch as they further this goal. Whereas Croft envisages language changing as a consequence of reanalysis of form–meaning mappings during the continual negotiation for meaning inherent in communication, Nowak and colleagues see a much more direct link between language's function for communication and its cultural evolution.

The argument runs as follows: individuals in a population have different grammars, and different grammars vary in the communicative payoff that they offer an individual using that grammar (dependent, of course, on the proportion of the different grammars in the population). Successful communicators have disproportionate access to reproduction, and children acquire the grammar of their biological parent(s). Under these assumptions, those grammars that offer the highest communicative payoff increase in frequency in a population – grammars that maximize communicative (and therefore reproductive) success will be selected and will proliferate. This is essentially a process where cultural evolution closely mirrors biological evolution under natural selection – cultural evolution favors traits that lead to biological reproduction, because biological reproduction is the only route to cultural persistence.

Nowak *et al.* have used this general framework to look at the function-driven cultural evolution of vocabulary systems and to quantify how accurate language acquisition must be if a population is to converge on a shared grammar. In terms of broader application, their model of cultural evolution dovetails nicely with models of biological evolution to provide evolutionary explanations for the capacity for phonemic coding and compositionality. As such, it constitutes a useful and flexible tool for investigating a wide range of evolutionary questions about language, using established techniques from evolutionary biology.

The value of this theory is more questionable when we move beyond questions of language origins to consider the subsequent change in linguistic systems (although it should be emphasized this was not the primary explanatory goal of this theory). It is highly unlikely that the majority of attested language changes are driven by differential reproduction. The main problem with this biologically motivated theory of cultural evolution, then, is that it cannot (or should not) provide a uniform mechanism for thinking about the cultural origins and subsequent evolution of linguistic systems. This has been acknowledged by the proponents of this theory, who state that "Neutral [i.e., not reproductively driven] language dynamics provide an appropriate description for many language changes studied in historical linguistics" (Komarova and Nowak, 2003: 457).

Cultural Evolution and the Linguistic Enterprise

Theories of the cultural evolution of language interface at various points with other areas of linguistics. For example, such theories may be motivated by experimental evidence relating to children's language-learning biases, or by the rich range of data available on language change, or they might explain a particular typological distribution, or a characteristic design feature of language. These are all worthwhile links between theories dealing with the cultural evolution of language and other subfields of linguistic research and bode well for continuing integration of cultural ways of thinking into these fields.

As mentioned in the Introduction to this article, there is one further, more fundamental way in which an understanding of cultural evolution impacts on linguistic theory. Noam Chomsky, in his 1965 book *Aspects of the theory of syntax* and subsequent works, gives a set of criteria for evaluating the adequacy of a linguistic theory, the ultimate criterion being that linguistic theories should achieve **explanatory adequacy**. A linguistic theory achieves explanatory adequacy if it can account for how a language learner acquires a descriptively adequate grammar on the basis of exposure to linguistic data, where those linguistic data are of the sort that a language learner can expect to be exposed to.

Chomsky argues that such an explanatorily adequate theory must provide an account of children's innate linguistic knowledge, characterized informally as a 'language instinct' or more formally as "first, a linguistic theory that specifies the form of a possible human language, and second, a strategy for selecting a grammar of the appropriate form that is compatible with the primary linguistic data" (Chomsky, 1965: 25). As previously argued by, e.g., Hurford (1990), Kirby (2002), Kirby *et al.* (2004), and Brighton *et al.* (2005), the nature of these capacities cannot be considered in isolation of the dynamics of cultural transmission and cultural evolution.

First, cultural evolution resulting from the cultural transmission of language can act as an alternative mechanism that constrains the range of possible human languages. For example, the bottlenecked transmission account predicts that only highly regular and highly compositional systems will be possible human languages when viewed on any significant cultural timescale. Language learners may be capable of learning and representing systems of varying degrees of compositionality and as such these may constitute 'possible human languages' from the point of view of individual language learners. However, only highly regular, recursively compositional languages are culturally stable and therefore, ultimately, possible from the viewpoint of cultural evolution. To put it in cruder terms, we might be tempted to look at the linguistic systems of the world, recognize that all such linguistic systems are recursively compositional, and conclude that this recursive compositionality constitutes part of the learner's innate prespecification of a possible human language. The cultural account of this linguistic universal shows that this is not necessarily a valid conclusion to draw – the cultural transmission of language, and its concomitant evolution, offers another possible explanatory mechanism for this constraint on the possible forms of language. In more general terms, **any** cultural dynamic is likely to obscure the relationship between attested features of language and innate constraints, due to the fact that cultural evolution also acts to constrain the range of possible human languages. As such, the cultural transmission of language potentially plays a key role in the central goal of developing explanatorily adequate linguistic theories.

Second, taking cultural evolution seriously may also impact on the second foundation of Chomsky's explanatorily adequate theory, which requires that children be provided with a strategy for selecting a grammar of the appropriate form that is compatible with the linguistic data. The biased transmission theories of cultural evolution turn this issue on its head. Rather than the onus being on the child to identify a grammar consistent with the data, the onus is on **language itself** to ensure that it is identified by children from the data it produces. If a particular aspect of linguistic structure is routinely misidentified by language learners, it will not persist. Conversely, if language learners find it easy to identify a particular aspect of structure from data, they will themselves produce further examples of this structure, which will lead to the continued survival of that linguistic structure. Cultural evolution provides a mechanism by which languages can adapt so as to make themselves readily identifiable, rather than placing the burden of explanation on the child's innate knowledge of language.

A theory of language that does not reckon with these types of phenomena, arising from the cultural transmission of language, risks overestimating the burden placed on language learners and is consequently in danger of overemphasizing the role that innate linguistic knowledge must play in an explanatorily adequate linguistic theory.

See also: Design Features of Language; Formal Models and Language Acquisition; Formulaic Language; Levels of Adequacy, Observational, Descriptive, Explanatory;

Linguistic Universals, Chomskyan; Origin and Evolution of Language.

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Culture in Language Teaching

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Culture has always been an integral component of language teaching. Until World War II, culture used to be seen as the literate or humanities component of language study. After the war and following the communicative turn in language pedagogy, it became synonymous with the way of life and everyday behaviors of members of speech communities, bound together by common experiences, memories, and aspirations. These communities were seen as grounded in the nation – the national context in which a national language was spoken by a homogeneous national citizenry. In the last 10 years, this unitary conception of one language equaling one national culture has become problematic. National standard languages have come to be seen as arbitrary constructions of the 19th-century nation states as much as the social and political institutions that constitute national cultures. At a time of growing economic and political globalization, when cultural encounters are increasingly mediated by information technologies, whose and what culture(s) should we teach: national, regional, or global culture? Urban or rural culture? High brow or popular culture? Oral, written, or cyberculture? Gay culture? Marketing culture? And what disciplinary discourse should we